PATENT
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TITLE OF THE INVENTION

Feed Unit For Feeding Fuel Out Of A Fuel Tank

BACKGROUND OF THE INVENTION

The invention relates to a feed unit for feeding fuel out of a fuel tank of a motor vehicle, having a baffle which has a first chamber for collecting fuel, having a fuel pump for sucking up fuel and having a fuel-pump suction opening arranged in the vicinity of the bottom of the first chamber of the baffle.

Feed units of this type are frequently used in motor vehicles today and are known in practice. The chamber of the baffle generally has a bottom valve and is filled with fuel via a suction jet pump driven by the fuel pump. In addition, the baffle is arranged in a bottom region of the fuel tank, so that fuel can flow out of the fuel tank into the baffle via the bottom valve. The filling of the baffle via the suction jet pump ensures that, even if there is a very low fuel level in the fuel tank, the baffle is sufficiently filled with fuel.

When the fuel tank is empty, the baffle is also emptied, as a result of which the fuel-pump suction opening emerges out of the fuel. Before the fuel pump can feed fuel again, sufficient fuel has to be poured into the fuel tank, for example by means of a jerrycan, for fuel to penetrate into the baffle. Only when the fuel-pump suction opening is resubmerged into the fuel can the fuel pump feed fuel. However, a minimum quantity of fuel is required for this.

It is already been thought to arrange the baffle directly below a filler neck of the fuel tank. In this case, the baffle is filled at the beginning when the fuel is poured in. However, this arrangement of the baffle is frequently impossible in the case of fuel tanks nowadays, which are generally very shallow and angled.

The invention is based on the problem of designing a feed unit of the type mentioned at the beginning in such a manner that, after the first chamber of the baffle is emptied, the fuel-pump suction opening is reliably covered with fuel.

BRIEF DESCRIPTION OF THE INVENTION

This problem is solved according to the invention by a second chamber being connected to the first chamber via a valve, and by the valve being a throttle valve, with the volumetric flow of fuel that is restricted by the valve being smaller than the volumetric flow fed by the fuel pump.

This design makes it possible for the first chamber to be initially emptied, as in the case of the known feed unit, after the fuel tank has been emptied. Over a period of time which is dependent on the throttling action of the valve, fuel flows out of the second chamber into the first chamber and covers the fuel-pump suction opening. Feeding of the fuel pump is ensured by the invention. If, at the same time, a small quantity of fuel is put into the fuel tank, for example via the jerrycan, the feed unit according to the invention is capable of feeding the topped-up fuel.

The feed unit according to the invention has a particularly low outlay on installation if the second chamber is manufactured integrally with the baffle.

The second chamber could be arranged, for example, above the first chamber. However, according to another advantageous development of the invention, a filling of the second chamber can be ensured in a simple manner if the chambers are arranged at the same height. During the operation of the feed unit according to the invention, the second chamber, like the first chamber, can therefore be filled with fuel.

The feed unit according to the invention has a particularly low structural outlay if the valve is arranged in a common wall of the first chamber and of the second chamber.

According to another advantageous development of the invention, the baffle turns out to be particularly compact if the second chamber is designed as an annular chamber surrounding the first chamber. By this means, the feed unit according to the invention can be arranged in a simple manner even in particularly shallow and angled fuel tanks.

According to another advantageous development of the invention, a reliable filling of the second chamber with fuel can be ensured in a simple manner if the second chamber is arranged within the baffle and the common wall between the first chamber and the second chamber is lower than an outer wall of the baffle. Fuel can thus flow from the first chamber into the second chamber.

According to another advantageous development of the invention, the throttling of the fuel flowing from the second chamber into the first chamber requires a particularly low structural outlay if the valve is designed as an opening with a designated cross section.

During the emptying of the first chamber, the valve has to throttle an over flow of fuel out of the second chamber into the first chamber, so that, when the fuel tank is empty, sufficient fuel remains in the second chamber. According to an advantageous development of the invention, sufficient throttling of the overflowing fuel can be achieved in a simple manner with customary volumes of known baffles if the valve throttles the volumetric flow, which flows from the second chamber into the first chamber, in such a manner that the level is equalized in three to five minutes after the fuel pump has stopped.

According to another advantageous development of the invention, a sufficient fuel level in the first chamber after the fuel tank has been emptied can be reliably ensured if the second chamber has a volume of approximately 10-20% of the baffle volume.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention permits numerous embodiments. To further clarify its basic principle, one of these is illustrated in the drawing and is described below. In the drawing

Fig. 1 shows schematically a longitudinal section through a fuel tank with a feed unit according to the invention arranged therein,

Fig. 2 shows the feed unit according to the invention from figure 1 after the fuel tank has been topped up with a small quantity of fuel.

Figure 1 shows schematically a longitudinal section through a fuel tank 1 for a motor vehicle, having a feed unit 2 which is arranged in the bottom region and is intended for feeding fuel out of the fuel tank 1 to an internal combustion engine 3 of the motor vehicle. The feed unit 2 has a baffle 4 with an electrically operated fuel pump 5 arranged therein. A suction opening 6 of the fuel pump 5 is arranged in the bottom region of a first chamber 7 of the baffle 4. A forward flow line 8 leads from the fuel pump 5 to the internal combustion engine 3. Furthermore, a suction jet pump 9 is arranged in the bottom region and is supplied with fuel as the working fluid via a fuel line 10 branching off from the forward flow line 8. The suction jet pump 9 sucks up fuel via a bottom valve 11 arranged on the baffle 4, and conveys the fuel into the first chamber 7 of the baffle 4.

A wall 12 for separating off the first chamber 7 from a second chamber 13 is arranged in the baffle 4. The wall 12 has a valve 14 which is designed as a throttle valve and permits fuel to flow through into the first chamber 7. The wall 12 separating the chambers 7, 13 from each other is lower than an outer wall 15 of the baffle 4. This ensures that, during normal operation of the feed unit 2, the second chamber 13 is at all times filled with fuel.

During the operation of the feed unit 2, the internal combustion engine 3 is supplied with fuel and at the same time the baffle 4 is filled with fuel via the suction jet pump 9. The filling of the baffle 4 with fuel is ensured as long as the fuel level in the fuel tank 1 reaches as far as the bottom valve 11. If the fuel level drops below the bottom valve 11, the feed unit 2 supplies the internal combustion engine 3 with fuel until the first chamber 7 of the baffle 4 is empty, as illustrated in figure 1. The internal combustion engine 3 therefore does not obtain any fuel and the fuel pump stops. A topping-up of the fuel tank 1 with fuel takes place generally with a very small quantity. This quantity is generally sufficient in order to enable the level in the fuel tank 1 to rise again as far as the bottom valve 11. Since, however, the suction opening 6 of the feed unit 2 in the baffle 4 is arranged higher than the level in the fuel tank 1, the feed unit 2 can only suck up fuel again and the suction jet pump 9 can be supplied with fuel as the

working fluid if the fuel level in the first chamber 7 is higher than the suction opening 6 of the feed unit 2.

After the first chamber 7 has been emptied, fuel present in the second chamber 13 flows via the valve 14, which is designed as a throttle valve, slowly into the first chamber 7, as illustrated in figure 2. The throttling action is configured in such a manner that the hydraulic equalizing operation lasts for three to five minutes. The flowing of the fuel through into the first chamber 7 causes the suction opening 6 to again be situated below the fuel level. The feed unit 2 can therefore supply the internal combustion engine 3 and the suction jet pump 9 again with fuel.

The throttling of the volumetric flow, which is guided into the first chamber 4, by the valve 14, which is designed as a throttle valve, is dimensioned in such a manner that the fuel flows more slowly into the first chamber 7 than the feed unit 2 feeds fuel to the internal combustion engine 3.